has been overflown by lava at various times, but especially by the eruptions of the last two years. Last June, arising from the plain or platform of lava formed by the filling of the crater, was the cone of eruption. This was situated east-north-east of the axis of the mountain. It formed a small steep-sided cone till the eruption of July destroyed the northern portion, forming a large low crater. Its condition on November 5, when I visited the crater or craters, was most instructive, and reminds one of a figure and description given by Sir W. Hamilton in his "Campi Phlegrei."

Arriving at the edge of the 1872 crater from the west one crosses the crater plain, and arrives at a low semicircular ridge with an average height of about twenty feet. Ascending this rim-like heap of scoria, one observes occupying its irregular bottom fumaroles and yellow patches of decomposing lava. The complete crater of July is formed of this ridge, together with the southern portion of the former cone of eruption. Within this space rose another cone of eruption whose centre was occupied by the main vent. On this occasion it was possible to approach within a few yards of the great mouth, from which issued the column of vapour and momentary puffs of fluid lava fragments. Thus it will be seen that there are at present three cones and craters one within the other.

This, however, was not the most interesting point. In the lava of the great plain we discovered a large cone or lava tunnel about eight feet high, twenty or thirty feet long, and fifteen feet broad, but with a general slope downwards. The roof was composed of lava about eight months old, but much decomposed. The whole cave presented one glistening forest of stalactites, some three hundred about were counted; also stalagmites. Most of these were from two to three feet long, and a few twice that length; many, however, with a uniform diameter of less than an inch throughout and tubular, divided by septa, reminding one of an Orthoceras in structure. The colours most various and beautiful: bird's-egg blue, acqua marine, salmon white, yellow, and reddish brown, and many variegated in these colours. The effect after the eyes quitting the rugged and fierce scenes around seemed to rest on some fairy cave.

On attempting to approach the entrance the gust of hot air, redundant with hydrochloric acid vapour, almost prevented one from making an attempt at an entrance. However, these beautiful and interesting prizes determined me to make an endeavour. Nose and mouth muffled, and having placed my friends on each side of the entrance with a strap, I made a dive down some steps. The effect was at first almost suffocation, stinging of the conjunctiva, and a profuse perspiration. To grab a few of those stalactites near at hand and return was the work of a minute, then the hearty pull-up by my friends, a fit of coughing and a little fresh air restored me. This was repeated eight times, during which I was able to obtain all the best specimens, some thirty examples, and reach the extremity of the cavity. These prizes were carried carefully to Naples, where they have been placed under glass in a dry atmosphere, since they were highly deliquescent. A qualitative analysis gives the chief component as chloride of sodium, with chlorides of potassium, iron, manganese; sulphates of soda, potash, iron, and copper.

They were undoubtedly formed in the following manner:—The heavy rains we have had here lately dissolved out the materials from the decomposing lava above. The solution as it descended was evaporated by the current of hot air continually circulating through the cave, thus driving off the water and depositing the salt. Many showed within their cavities crystals of Halite Sylvine, and a few also Molysite.

December.—In the early part of this month lava commenced to flow down the eastern or Pompei side; this, although not seen from Naples, gave a brilliant reflection at night which could be observed from the city. This aurora continued with variable intensity until December 25, 1881, when it reached its climax. The lava had commenced to issue by a fissure nearly north of the base of the cone of eruption. During the three weeks that it flowed this fissure had become widened and opened up. On Christmas and the following day the quantity of lava increased much in quantity, and altogether Vesuvius was much more active. The rent at this time had extended down the slope about one-third the distance of the Vesuvian cone and formed at its upper or wider part, an opening of about 120 feet in breadth by the same in depth. The floor which I visited and walked up on December 29 was covered by the scoria and lava blocks continually falling from its edges. This floor sloped downwards to the end of the fissure at a small inclination. From its termination issued the larva already spoken of.

This was a good example of the opening up of a dyke to the surface of a volcanic cone, so lucidly described by Mallet ("Mechanism of Production of Volcanic Dykes, and on those of Mount Somma," *Quart. Journ. Geol. Soc.* vol. xxxii. p. 472).

The lava that issued at first descended the cone, crossed the Valle dell' Inferno, following the course of the 1834 stream, and threatening Otajano. It stopped, however, and followed a course across the Atrio in a north-east direction, where it can do no harm.

An important fact was brought out by this eruption, small as it was. When the level of the lava in the vent had been lowered by exclusion of the fissure downwards an entire change of ejectamenta took place. The soft masses of pasty lava as ejected generally was replaced by rounded fragments of solid and old lava and volcanic ashes. The cone of eruption having no longer the column of lava to support it internally had crumbled in and was being ejected piecemeal by the explosions in the form of stones and ash. This we had practical experience of. At one time approaching somewhat incautiously through the mist we were practically warned to beat a hasty retreat by hearing the rattle around us of small, and the heavy thud of larger stones. The beautiful yellow crater plane of 1872 had been covered by the dull grey ash, only relieved by numerous green-coloured saline crusts rich in copper. This was made evident on looking at our boot-soles, where we found the nails thickly plated with metallic copper.

Near the end of the above-mentioned fissure the lavas were flowing down the mountain in a tunnel. The roof had broken through at one place, and standing a few yards above this a fine sight presented itself. Figure a long fairly regular arched passage of about a metre and a half wide by the same in depth, along which one could see for one or two hundred yards.

This was bright red-hot, and flowing along its floor with considerable rapidity was a stream of bright orange-coloured lava with the liquidity almost of water. In this we were able to carry on some experiments on the specific gravity of molten and cold lava, which reverse the results obtained on former occasions by Palmieri and others, and which will prove that cold is of higher specific gravity than molten rock, as theoretically should be the case. These facts, however, will be described elsewhere.

H. J. JOHNSTON-LAVIS

ILLUSTRATIONS OF NEW OR RARE ANIMALS IN THE ZOOLOGICAL SOCIETY'S LIVING COLLECTION[1]

V.

11. THE Beatrix Antelope (*Oryx Beatrix*).—The antelopes of the genus Oryx constitute a well-defined and most beautiful group of the Bovine Family. Although not amongst the largest of the antelopes, they are animals of above the average size in the group. The males are

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[1] Continued from vol. xxiv. p. 534

furnished with very long straight or slightly recurved horns, which are also present, though not quite so highly developed, in the females. These organs are more or less ringed at the base, and are placed in a line with the anterior surface of the face, or nearly so. They constitute a formidable weapon of attack and defence, and on this account become frequently broken in the case of captive specimens. The colour of the Oryxes is generally of a brilliant white, ornamented by black streaks, and occasionally clouded with shades of grey and rufous.

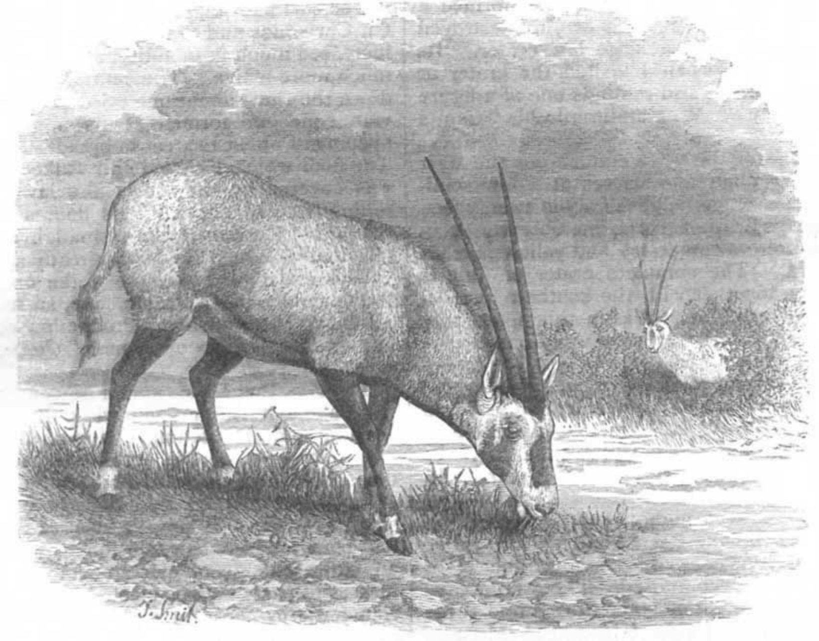

Fig. 11.—The Beatrix Antelope.

The best known member of the genus Oryx is the Leucoryx (*Oryx leucoryx*), a native of Senegal, but also met with in Sennaar and Nubia. Of this antelope, examples have been for many years in the Zoological Society's Menagerie, and have bred young ones on several occasions. Besides this species the Society's Collection contains at present several specimens of the still more beautiful Beisa Antelope (*Oryx beisa*), of Abyssinia. This antelope bred in the Society's Gardens last year, and the young animal has been figured in a re-

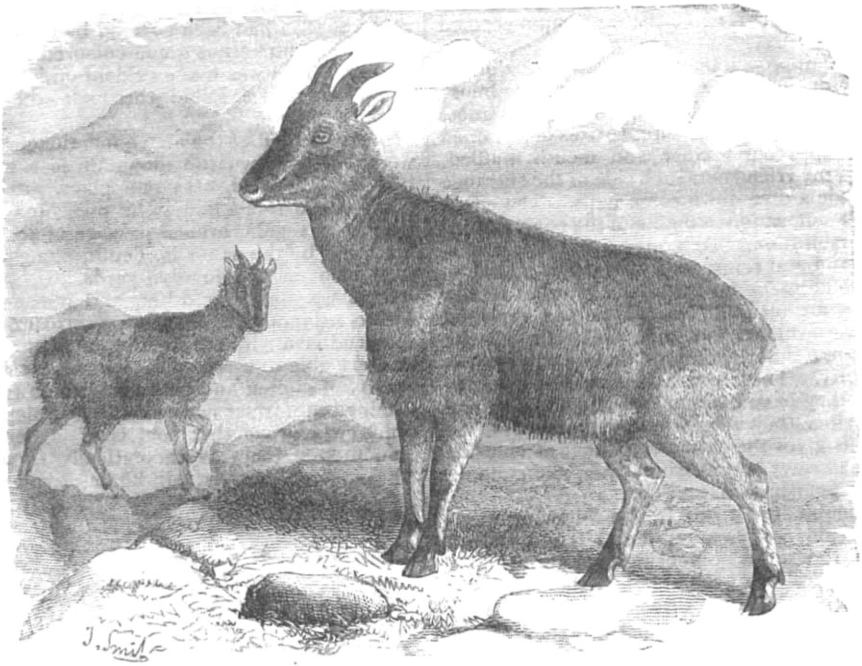

Fig. 12.—The Thar.

cent number of the *Proceedings* (see *Proc. Zool. Soc.*, 1881, p. 626, pl. liv.). Of the allied Gemsbuck of South Africa, well-known to the sportsmen of the Cape, though, according to Mr. Selous, now entirely confined to the arid deserts of the south-west, the Zoological Society have not, of late years at least, been able to exhibit living specimens. But the celebrated collection of the late Lord Derby formerly contained examples of both sexes, and the young, bred at Knowsley, is figured in the volume entitled "Gleanings from the Knowsley Menagerie."

To the three species above-mentioned of the genus *Oryx*, which have long been known to naturalists, a fourth was added some twenty years ago by the late Dr. Gray, who, in 1857, at one of the Zoological Society's meetings (see *Proc. Zool. Soc.*, 1857, p. 157, pl. lv.), described a new species based upon an animal received from Bombay, but supposed to have been originally brought from some part on the Red Sea. This species, as Dr. Gray pointed out, is in some respects intermediate between the Gemsbuck and the Leucoryx, having the straight horns of the former and the plain colour of the latter, but the dark legs and peculiar white feet at once separate it from both of them.

The Beatrix Antelope (*Oryx Beatrix*), as it was named by Dr. Gray after the Royal Princess of that name, although thus clearly defined, and excellently figured by Mr. Wolf, remained a somewhat obscure species until 1872, when, singularly enough, a second living example was received by Mr. Gwyn Jeffreys, F.R.S., from Colonel Pelly, H.B.M. Resident at Bushire, and deposited in the Society's collection. In 1878 a third example of the same antelope was received by the Society from Commander Burke, of the SS. *Arcot*. This animal was obtained at Jedda, but was stated to have been originally captured in the Hedjez passes, some 150 miles in the interior of Arabia.

The fourth example of this antelope, lately presented to the Society by Lord Lilford, from which the present figure is taken (Fig. 11), comes from a still more definite locality. It was shipped to Lord Lilford by Lieut.-Col. S. B. Miles, British Consul at Muscat, with the information that it came from the great desert behind the mountainous district of Oman. It is now therefore abundantly evident from these four examples, which agree in all material points, that the Beatrix Antelope is a good and well-defined species, and that its native home is the interior of the Arabian peninsula, where it replaces the Beisa of the Abyssinian plateau.

12. The Thar (*Capra jemlaica*).—The peculiar Himalayan Goat, known to the Indian sportsmen as the Téhr, Thar, or Tahir, was first described in 1828 by Hamilton Smith, and named *Capra jemlaica*, from the district of Jemlah, to the north of Nepaul, in which his specimen was procured. It is found, however, as Dr. Jerden tells us, throughout "the whole extent of the Himalayas at great elevations, generally above the limits of forest and not far from the snow. It frequents rocky valleys and very steep and precipitous ground, and is often seen perched on what appear to be inaccessible crags. It feeds on the grassy spots among rocks, and though not unfrequently solitary, is more generally seen in flocks, sometimes as numerous as twenty, thirty, or even forty. If alarmed whilst feeding, these animals all go off at full speed with a clattering sound, but soon halt and turn to gaze on the intruder. They generally follow the guidance of an old male, and will make their way up almost perpendicular precipices if there be but a few rough edges or crevices. In the north they are said to be sometimes seen in company with the *Markkor* (*Capra megaceros*)."

The Thar also extends into Cashmere, and was found by Dr. A. Leith Adams to be common on the Pir Pinjal ranges, and still more so on the mountains on the banks of the Chenab, near Kistewar.

The first example of this wild goat received by the Zoological Society was obtained in 1852, and lived some years in the Menagerie (see Wolf and Sclater, *Zool. Sketches*, ser. i. t. xxv.). After the death of this animal the species remained unrepresented in the collection until 1880, when the examples now in the Gardens were presented to the Zoological Society by the Prince of Wales. His Royal Highness, on his return from India in 1876, brought home with him a pair of these animals, from which a young one was produced. The male unfortunately died at Sandringham, so that only the mother and young (also of the female sex) were transferred to the Society. Fig. 12 represents the adult female, in which the horns, although nearly of the same character as in the male, are not so large or so well developed.

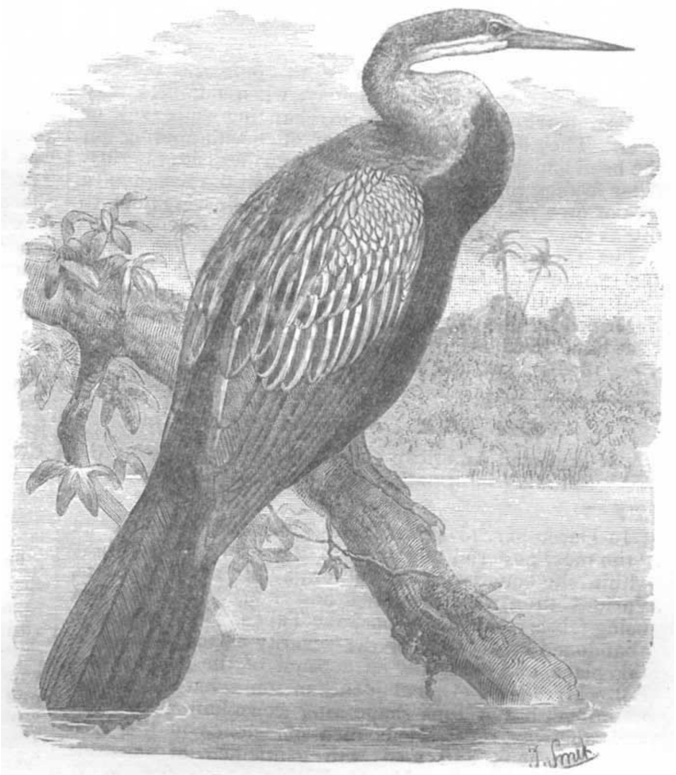

FIG. 13.—The Indian Darter.

13. The Indian Darter (*Plotus melanogaster*).—The Darters form a very peculiar type of birds of the order Steganopodes, allied to the Cormorants in structure, but very Heron-like in gait and gesture. For several years the Zoological Society's fish-house has not failed to contain one or more specimens of these birds, which have given us abundant opportunities of observing their peculiar mode of fishing. The Darter in its normal position sits erect upon a branch or stump overlooking the water. When proceeding to fish it dives head foremost into the stream, and swimming entirely under water, transfixes its finny prey with the rapidity of lightning. Emerging from the water with the fish speared upon its long slender beak, the Darter chucks the fish into the air, and catching it head foremost with unerring aim, swallows it whole. This peculiar and interesting mode of fish-catching may be witnessed every day when the Darters in the Zoo-

logical Gardens are fed with their usual meal of small fishes.

The Darters usually exhibited in the Society's Gardens are of the South American species (*Plotus anhinga*), which, it seem, is the most easily obtained alive. But in 1878 an example of the African form Le Vaillant's Darter (*Plotus levaillanti*)[1] was received, and lived for some time in the Gardens, where it exhibited the characteristic mode of feeding previously observed in its American brother. In April last an example of a third species of this genus—the Indian Darter (*Plotus melangaster*) was obtained in exchange from the Zoological Gardens of Calcutta. After living for many months in excellent health this bird died suddenly on the 21st of December last, apparently from a sudden shock produced by feeding too rapidly.

In captivity the Indian Darter does not deviate as regards habits from the species previously received. "In a state of nature," as Dr. Jerden tells us, "this beautiful diver is found throughout all India, Ceylon, Burmah, and Malayana. It is exceedingly numerous in some parts of the country, especially in Bengal; hundreds are often to be seen on a single jheel. They hunt singly in general, or in scattered parties, but often roost in company, both at night and in the middle of the day, when numbers may be seen perched on the trees overhanging some tank or river. They float low on the water, often with nothing but the head and neck visible, and swim and dive with rapidity. After feeding for some time they perch on the bough of a tree or on a pole or stone, and spread their wings out to dry as the Cormorants do."

The Darters present some very abnormal features in the structure of the stomach and in the mechanism of the vertebræ of the neck. These have been elaborately described by the late Prof. Garrod from the specimens that have lived in the Society's Collection (*Proc. Zool. Soc.*, 1876, p. 335, and 1878, p. 679.

THE LICK OBSERVATORY

AN esteemed American correspondent has sent us the following information on this remarkable observatory:—

In December, 1874, Mr. James Lick determined to erect "the most powerful telescope in the world," somewhere within the boundaries of California, his adopted State. Various sites were proposed and considered, the first being Observatory Point on Lake Tahoe, which was soon abandoned on account of the severity of the winters at this place, and especially on account of the great snowfall. Mr. Lick's original idea was somewhat crude and unformed, but it took shape after consultation by letter and otherwise with various men of science in the East and elsewhere, and also with gentlemen of scientific tastes in California. Monte Diablo (3856 feet high), Mount Helena (4343 feet high), and other points, were successively proposed and, after examination, rejected. Finally, Mr. Lick sent Capt. Fraser, his man of business, to examine Mount Hamilton (4440 feet), an easily accessible peak some thirteen miles east of San José, in Santa Clara County. The first examination was made by Capt. Fraser, in August, 1875.

In most respects this site was found to be satisfactory, but the chief objections to it were found to be important, if not vital. The cost of constructing a road to the summit would certainly be very great, and the summit itself was a sharp point of very hard trap rock. To make a level space here for the reception of the necessary buildings would be a serious matter. Finally, no water was known anywhere near the summit. The last objection was disposed of by the discovery of two springs, only 4300 feet distant from the summit and 300 feet below it. Mr. Lick then announced that if Santa Clara County would build a suitable road connecting San José with the top of the mountain, he would establish and suitably endow an observatory on Mount Hamilton. After various changes in his plans Mr. Lick made a deed of trust (dated September 21, 1875), which gave a very large amount of real and personal property to five trustees to be by them expended for various purposes. The observatory was provided for as follows:—The trustees were authorised to expend the sum of 700,000 dollars for the purchase of the necessary land and for putting up on that land "a powerful telescope, superior to and more powerful than any telescope ever yet made," with the necessary machinery, &c., "and also a suitable observatory connected therewith." As soon as these objects are satisfactorily accomplished the observatory is to be turned over to the Regents of the University of California, to become a department of the University, and any surplus left over after paying for the land and observatory is to be invested in safe bonds. The income from these bonds is to be devoted to "the maintenance of the said telescope and of the observatory connected therewith, and shall be made useful in promoting science."

A grant of land was obtained from the United States; the proposition of Mr. Lick to Santa Clára county was accepted, and the road to the top of Mount Hamilton was built during 1876. It was formally accepted by the Trustees in January 1877. It is now maintained by Santa Clara county as a county road, and it is quite likely that it will soon be extended by Alameda county over the range into the San Joaquin valley. Probably no more magnificent mountain road exists in the United States, when one considers all the circumstances of fine surrounding scenery, excellent road-bed, and commanding views. Some idea of the engineering difficulties overcome can be had from the cost of constructing this highway twenty-six miles into the heart of the mountains, and with a rise of 4000 feet in twenty-two miles. Such a project would appal the average county surveyor of New England, but it was here accomplished at the large cost of 78,000 dols.

The maximum grade is 6 feet 6 inches in 100 feet, or about 343 feet in the mile. Most of the road, however, is materially less steep than this. The first four miles is a fine level avenue, laid out in a perfectly straight line in the Santa Clara valley. The ascent of the foothills is then commenced, and the road begins a series of turnings and twistings which are of course necessary to keep the gradient low. Toward the end of the route the road winds round and round the mountain itself and overlooks one of the most picturesque of scenes: the valley of Santa Clara and the coast range to the west, a bit of the Pacific to the south-west, the Sierra Nevadas with countless ranges between, to the south-east the San Joaquin valley, and the Sierras beyond to the east, while to the north on clear days you plainly see Mount Shasta (14,000 feet) 175 miles away. The bay of San Francisco lies open before you, like a child's dissecting map, and at the end of it Tamalpais, the mountain near the entrance to the Golden Gate.

Mount Hamilton has, properly speaking, three summits. The east peak is 4440 feet, the middle peak is 4350 feet, and the third, the observatory peak (originally 4256 feet), has been cut down to a level surface just large enough to contain the necessary buildings for the instruments. The dwelling-house and workshops are on a narrow saddle some 50 feet below the summit. To gain the level surface some 29 feet of rock has been removed from the peak; in all about 40,000 tons. A level site is thus provided, and this is perfectly accessible from San José. With a light waggon one may trot the horses all the way. The springs have also been connected with "the hill," as it is called by the inhabitants, by a good

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[1] The discovery recently made by Canon Tristram of the occurrence of this Darter breeding in large colonies on the Lake of Antioch is very remarkable, the species not having been previously known to occur north of Sennaar.